Office of Technical Assistance Research Proposal

Waterborne Alternatives to Solvent Based Inks in Rotogravure Printing

Background:

Rotogravure printing is the dominant gravure printing process. In this process web presses are employed and copper cylinders into which images are etched are utilized. The etched images are filled with ink and the image is then transferred from the cylinder to the substrate of interest. Characteristic of this method of printing is a sharp, fine image.

The printing industry has been moving in a direction away from solvent-based inks for a number of years. Significant strides have been made in this effort. Replacements have been found for a large number of inks and a large number of applications. Alternatives have included water-based inks, UV-cured inks and E-beam technology. Water-based inks are now being used in rotogravure printing, especially for packaging and product gravure. Their higher surface tension and slower drying rate, however, continue to be obstacles to their expanded use.

Some of the applications that still use solvent-based inks include those for which there are not suitable alternatives, either for the printer or which do not satisfy the needs of the customer. Here remain the real challenges for the printing industry and the printing ink manufacturers.

Solvent-based inks present not only a worker health issue, but also a safety and liability issue, as well as the obvious environmental implications resulting from air emissions and the transport, handling and disposal of hazardous waste. Solvents with the largest use in ink formulations are isopropyl alcohol and ethyl acetate; these two are also used in cleanup in printing operations.

Scope of Problem:

The impact of the successful outcome of finding an alternative on Massachusetts industry could be very important. Were it to be limited to MA industry alone, it could provide a definite competitive advantage in terms of reduced costs associated with liability and regulatory compliance. It could bring more high-end product printing capability and business to the printers in the state. The number of companies and solvent used in the relevant industry sectors, with solvent use for TURA filers in those sectors are given in the table below:

SIC- Description	No. of Businesses (total)	No. of Filers (total)	No. of Filers ('99)	No. of Employees	Approximate Solvent Use	
					(pounds)	(year reported)
2671- Paper coating and laminating for packaging	20	6	3	3222	2,502,744	1999
2672- Paper coating and laminating, except packaging	32	11	9	2727	15,969,026	1999
2754- Commercial printing, gravure	3	1	1	3571	674,296	1999
TOTALS	140	20	13	9520	19,146,066	

The table includes SIC 2671 and 2672 because these sectors include predominantly those printers using the gravure process. Because of the somewhat imprecise nature of SIC categorization, many of the gravure printers list one of these two codes as their primary sector.

Objectives:

One of the remaining challenges mentioned above lies in finding an alternative to solvent-based inks for printing of high-end products by the gravure process. Problems with using water-based alternatives include appearance, leveling and metamorism (pigments not matching under different light sources). Some preliminary work has been done in this area by some of the ink suppliers, but satisfactory results have not always been achieved. There are other areas where there have been problems in the development of waterborne inks that have been at least partially overcome, but must nevertheless be kept in mind when developing an ink. These include minimizing drying time to the extent possible to prevent blistering, gloss reduction when converting from a solvent based to a waterborne ink, reduced abrasion resistance, and higher surface tension.

Scope of Work:

An industry partner is available and eager to assist with information and evaluations when appropriate. This is a MA rotogravure printer that has converted much of their operation from solvent based to waterborne inks. They understand the challenge explained above and are confronted with it themselves. Initial work they have undertaken with a major ink supplier has resulted in some progress, but results are not satisfactory to all customers. The main problem to be overcome appears to be that of metamorism. This printer has a sizeable operation and is willing to run trials on any waterborne ink developed which appears to hold promise. I believe that they also would be willing to hold discussions with any researcher interested in pursuing the problem and share information acquired to date which might assist them in their research.